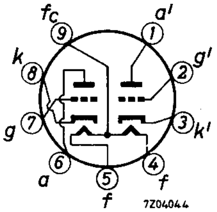
S.Q. TUBE

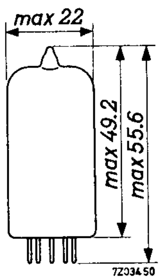
Special quality double triode designed for use as R.F. amplifier in grounded grid circuits, frequency changer (max. freq. 300 MHz) in mobile and industrial equipment with intermittent operation, and on-off control applications where operation under cut-off conditions is required.

QUICK REFERENCE DATA			
Life test	500 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval. Gold plated pins		
Heating	Indirect A.C. or D.C. Parallel or series supply		
Heater voltage	V_f	6.3 or 12.6	V
Heater current	I_f	300 or 150	mA
Anode current	I_a	10	mA
Mutual conductance	S	5.5	mA/V

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage (pin 9 and 4 + 5)	V_f	6.3			V
Heater current	I_f	300			mA
Heater voltage (pin 4 and 5)	V_f	12.6			V
Heater current	I_f	150	138 - 162		mA
Anode voltage	V_a	100			V
Cathode resistor	R_k	270			Ω
Anode current	I_a	3.3			mA
Mutual conductance	S	4.0			mA/V
Internal resistance	R_i	14.3			kΩ
Amplification factor	μ	57			
Cut-off voltage	$-V_g$	5			V
Anode voltage	V_a	100			V
Anode current	I_a	10			µA
Anode voltage	V_a	250			V
Cathode resistor	R_k	200			Ω
Anode current	I_a	10	7 - 14		mA
Mutual conductance	S	5.5	4.5 - 6.5	min. 3.8	mA/V
Internal resistance	R_i	10.9			kΩ
Amplification factor	μ	60	50 - 70		
Difference in anode current of two systems	$\|I_a - I_a'\|$		max. 3.2		mA
Negative grid current	$-I_g$		max. 0.7	max.0.7	µA
Cut-off voltage	$-V_g$	12			V
Anode voltage	V_a	250			V
Anode current	I_a	10			µA

CHARACTERISTICS (continued)

		I	II	III	
Cut-off voltage	$-V_g$	20			V
Anode supply voltage V_a = 250 V	V_a	250			V
Anode resistor R_a = 0.1 MΩ	R_a	0.1			MΩ
Anode current I_a = max. 100 μA	I_a		max.100		μA
Vibrational noise output Anode supply voltage V_{ba} = 200 V Grid voltage $-V_g$ = 3 V Anode resistor R_a = 2 kΩ (two sections in parallel) Vibration frequency 25 Hz Acceleration 2.5 g	V_o		max.100		mV_{RMS}
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 100 V	I_{kf}		max. 10	max. 10	μA
Insulation resistance between grid and cathode (V = 100 V)	R_{ins}		min. 100	min. 50	MΩ
anode and cathode (V = 300 V)	R_{ins}		min. 100	min. 50	MΩ

CAPACITANCES (Both sections if applicable)

Without external shield		I	II	
Anode to grid	C_{ag}	1.6	1.3 - 1.9	pF
Grid to cathode and heater	$C_{g/kf}$	2.5	2.0 - 3.0	pF
Anode to cathode and heater	$C_{a/kf}$	0.45	0.2 - 0.7	pF
	$C_{a'/k'f}$	0.38	0.16 - 0.60	pF
Cathode to heater	C_{kf}	2.8	2.1 - 3.5	pF
Anode to anode other section	$C_{aa'}$	0.24	0.15 - 0.33	pF
Cathode to grid and heater	$C_{k/gf}$	5.0		pF
Anode to grid and heater	$C_{a/gf}$	1.9		pF
	$C_{a'/g'f}$	1.8		pF
Anode to cathode	C_{ak}	0.2		pF
	$C_{a'k'}$	0.24		pF

CAPACITANCES (Both sections if applicable) (continued)

With external shield connected to the applicable cathode

Anode to grid	C_{ag}	1.6	pF
Grid to cathode and heater	$C_{g/kf}$	2.5	pF
Anode to cathode and heater	$C_{a/kf}$	1.2	pF
	$C_{a'/k'f}$	1.3	pF
Cathode to heater	C_{kf}	2.8	pF

With external shield connected to the applicable grid

Cathode to grid and heater	$C_{k/gf}$	5.0	pF
Anode to grid and heater	$C_{a/gf}$	2.7	pF
Anode to cathode	C_{ak}	0.18	pF
	$C_{a'k'}$	0.2	pF

SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 600 g supplied by an NRL shock machine with the hammer lifted over an angle of 42^{o}

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 25 Hz with an acceleration of 2.5 g

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 500 hours

Anode supply voltage	V_{ba}	=	250	V
Cathode resistor	R_k	=	200	Ω

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_0}	max.	600	V
	V_a	max.	330	V
Anode dissipation	W_a	max.	2.8	W
Grid voltage	$-V_g$	max.	55	V
Grid current	I_g	max.	250	μA
Grid resistor, fixed bias	R_g	max.	0.25	MΩ
automatic bias	R_g	max.	1.0	MΩ
Cathode current	I_k	max.	18	mA
Voltage between cathode and heater	V_{kf}	max.	100	V
Bulb temperature	t_{bulb}	max.	200	°C [1]

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 5.7 to 7.0 V will shorten the tube life.

OPERATING CHARACTERISTICS

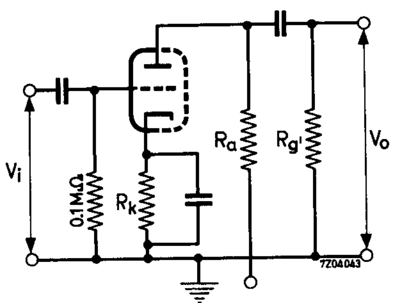


Fig.1

[1]) Tube life and reliability of performance will be enhanced by operation at lower temperatures.

OPERATING CHARACTERISTICS

As A.F. amplifier

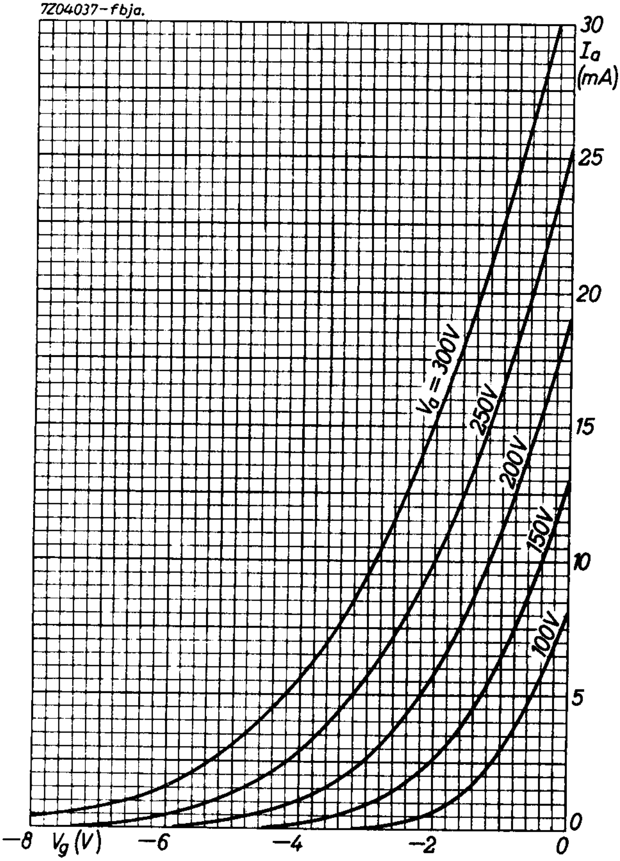
Resistance of voltage source = 200 Ω

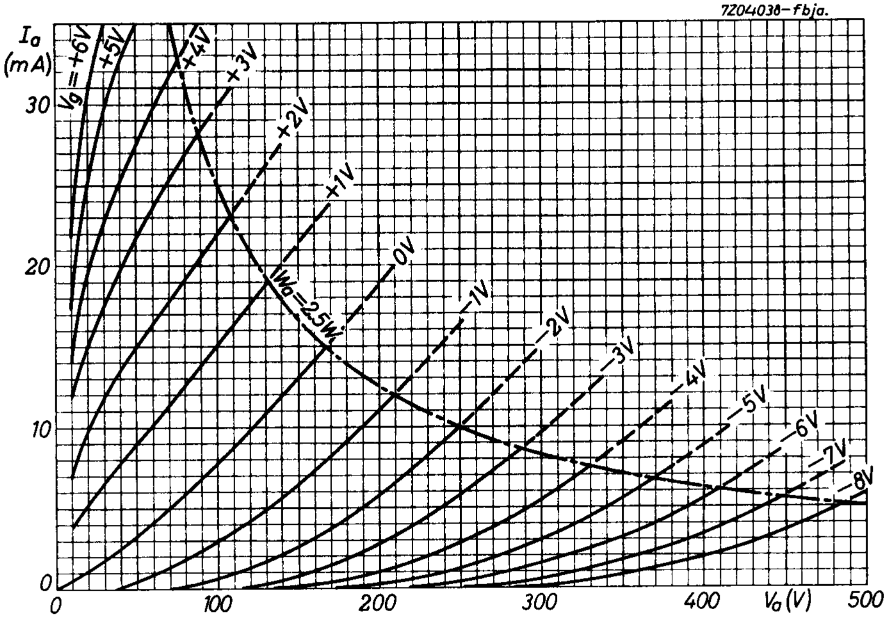
Anode supply voltage	V_{ba}	90	90	90	90	90	90	V
Anode resistor	R_a	0.1	0.1	0.24	0.24	0.51	0.51	MΩ
Cathode resistor	R_k	1600	1800	3800	4200	8000	9600	Ω
Grid resistor of next stage	$R_{g'}$	0.1	0.24	0.24	0.51	0.51	1.0	MΩ
Ouput voltage (d_{tot} = 5 %)	V_o	5.3	7.8	7.2	9.4	8.3	10	V_{RMS}
Voltage gain (V_o = 2 V_{RMS})	V_o/V_i	26	29	28	30	28	29	
Anode supply voltage	V_{ba}	180	180	180	180	180	180	V
Anode resistor	R_a	0.1	0.1	0.24	0.24	0.51	0.51	MΩ
Cathode resistor	R_k	1100	1400	2800	3300	5600	6700	Ω
Grid resistor of next stage	$R_{g'}$	0.1	0.24	0.24	0.51	0.51	1.0	MΩ
Output voltage (d_{tot} = 5%)	V_o	12	17	16	20	18	23	V_{RMS}
Voltage gain (V_o = 2 V_{RMS})	V_o/V_i	31	33	32	33	31	32	
Anode voltage	V_{ba}	300	300	300	300	300	300	V
Anode resistor	R_a	0.1	0.1	0.24	0.24	0.51	0.51	MΩ
Cathode resistor	R_k	1000	1200	3300	2800	4900	6000	Ω
Grid resistor of next stage	$R_{g'}$	0.1	0.24	0.24	0.51	0.51	1.0	MΩ
Output voltage (d_{tot} = 5%)	V_o	22	30	28	35	31	38	V_{RMS}
Voltage gain (V_o = 2 V_{RMS})	V_o/V_i	32	33	34	33	33	33	

OPERATING CHARACTERISTICS (continued)

Resistance of voltage source 100 kΩ

Anode supply voltage	V_{ba}	90	90	90	90	90	90	V
Anode resistor	R_a	0.1	0.1	0.24	0.24	0.51	0.51	MΩ
Cathode resistor	R_k	2000	2400	4700	5300	9300	11000	Ω
Grid resistor of next stage	R_g'	0.1	0.24	0.24	0.51	0.51	1.0	MΩ
Output voltage (d_{tot} = 5 %)	V_o	9.9	13	12	15	13	16	V_{RMS}
Voltage gain (V_o = 2 V_{RMS})	V_o/V_i	25	27	27	28	27	28	
Anode supply voltage	V_{ba}	180	180	180	180	180	180	V
Anode resistor	R_a	0.1	0.1	0.24	0.24	0.51	0.51	MΩ
Cathode resistor	R_k	1200	1400	2900	3600	6000	7100	Ω
Grid resistor of next stage	R_g'	0.1	0.24	0.24	0.51	0.51	1.0	MΩ
Output voltage (d_{tot} = 5 %)	V_o	17	28	25	31	27	33	V_{RMS}
Voltage gain (V_o = 2 V_{RMS})	V_o/V_i	31	33	32	33	31	32	
Anode supply voltage	V_{ba}	300	300	300	300	300	300	V
Anode resistor	R_a	0.1	0.1	0.24	0.24	0.51	0.51	MΩ
Cathode resistor	R_k	900	1200	2300	2900	5000	6400	Ω
Grid resistor of next stage	R_g'	0.1	0.24	0.24	0.51	0.51	1.0	MΩ
Output voltage (d_{tot} = 5 %)	V_o	35	47	42	52	45	55	V_{RMS}
Voltage gain (V_o = 2 V_{RMS})	V_o/V_i	33	33	34	34	33	34	


7Z04037-fbja.
30
I_a
(mA)
25
20
15
10
5
0
$V_a = 300V$
250V
200V
150V
100V
−8
V_g (V)
−6
−4
−2
0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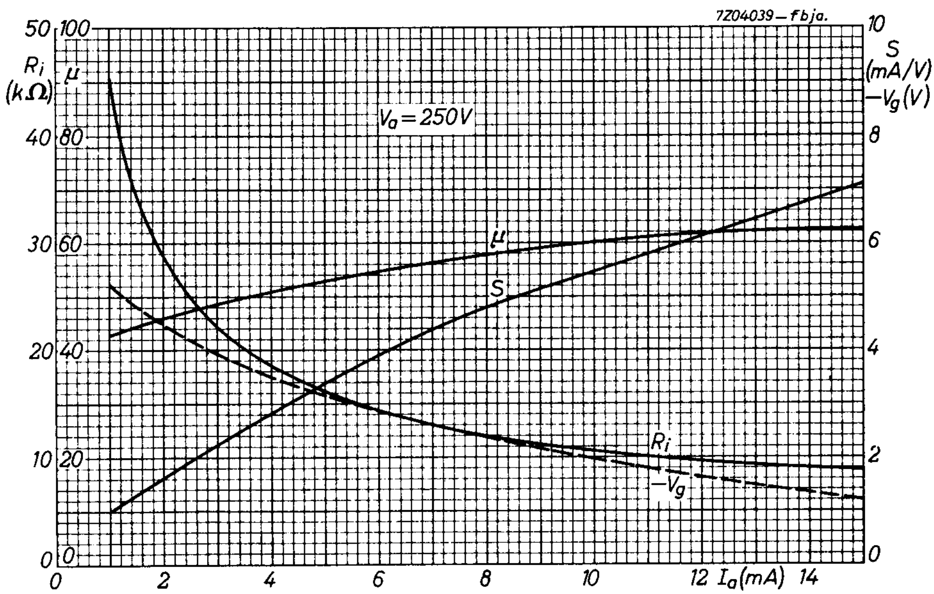
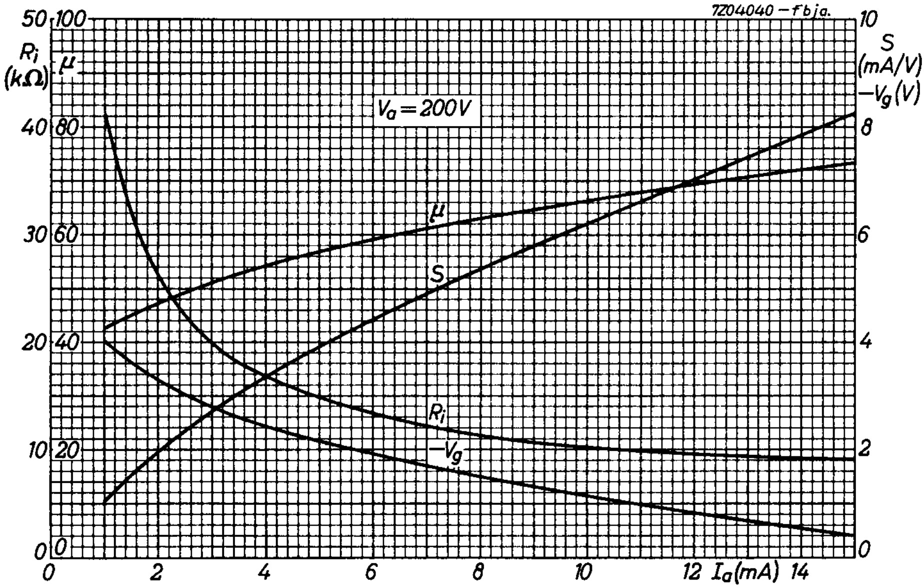
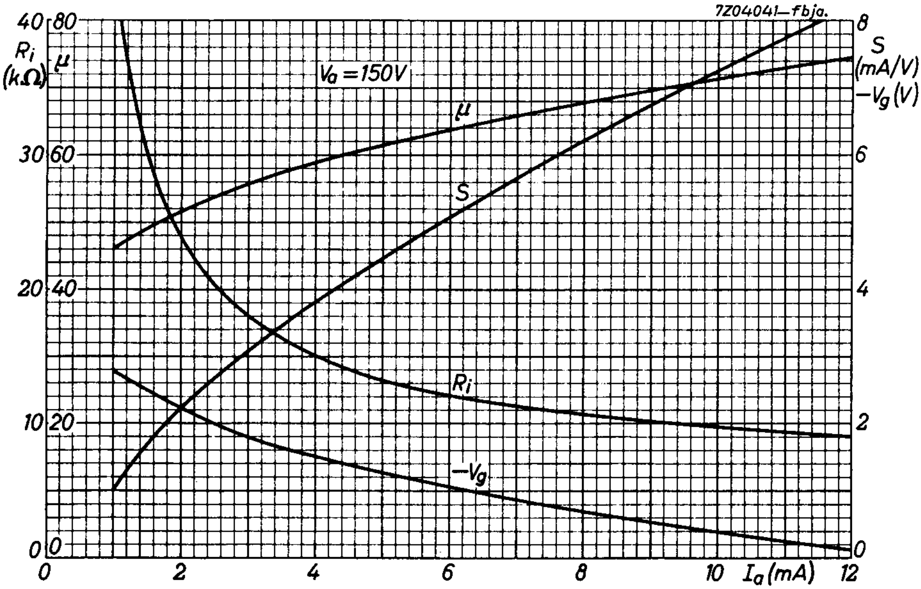
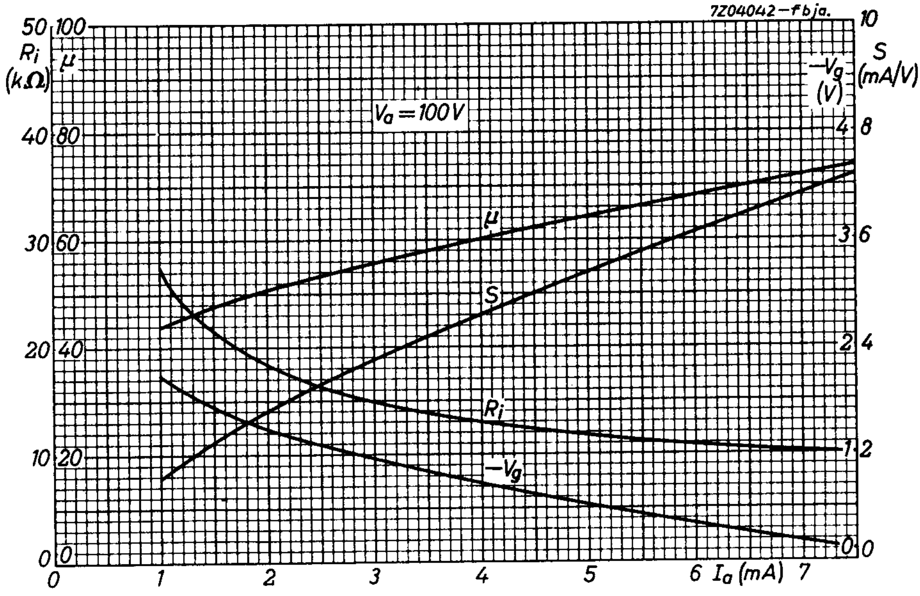
Ia (mA)
Vg = +6V
+5V
+4V
+3V
+2V
+1V
0V
-1V
-2V
-3V
-4V
-5V
-6V
-7V
-8V
Wa = 2.5W
Va (V)
0
10
20
30
100
200
300
400
500


7Z04039-fbja.
Ri (kΩ)
μ
S (mA/V)
-Vg (V)
Va = 250V
μ
S
Ri
-Vg
Ia (mA)
0
2
4
6
8
10
12
14
20
30
40
50
60
80
100


7Z04040 – fbja.
R_i (kΩ)
μ
S (mA/V)
$-V_g$ (V)
$V_a = 200V$
μ
S
R_i
$-V_g$
I_a(mA)
50 40 30 20 10 0
100 80 60 40 20 0
10 8 6 4 2 0
0 2 4 6 8 10 12 14


7Z04041–fbja.
R_i (kΩ)
μ
S (mA/V)
$-V_g$ (V)
$V_a = 150V$
μ
S
R_i
$-V_g$
I_a(mA)
40 30 20 10 0
80 60 40 20 0
8 6 4 2 0
0 2 4 6 8 10 12


7Z04042-fbja.
50
R_i
(kΩ)
40
30
20
10
0
100
μ
80
60
40
20
0
10
S
(mA/V)
$-V_g$
(V)
4 8
3 6
2 4
1 2
0 0
$V_a = 100 V$
μ
S
R_i
$-V_g$
0
1
2
3
4
5
6 I_a (mA) 7

PHILIPS

Data handbook

Electronic components and materials

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